



NOT TO SCALE

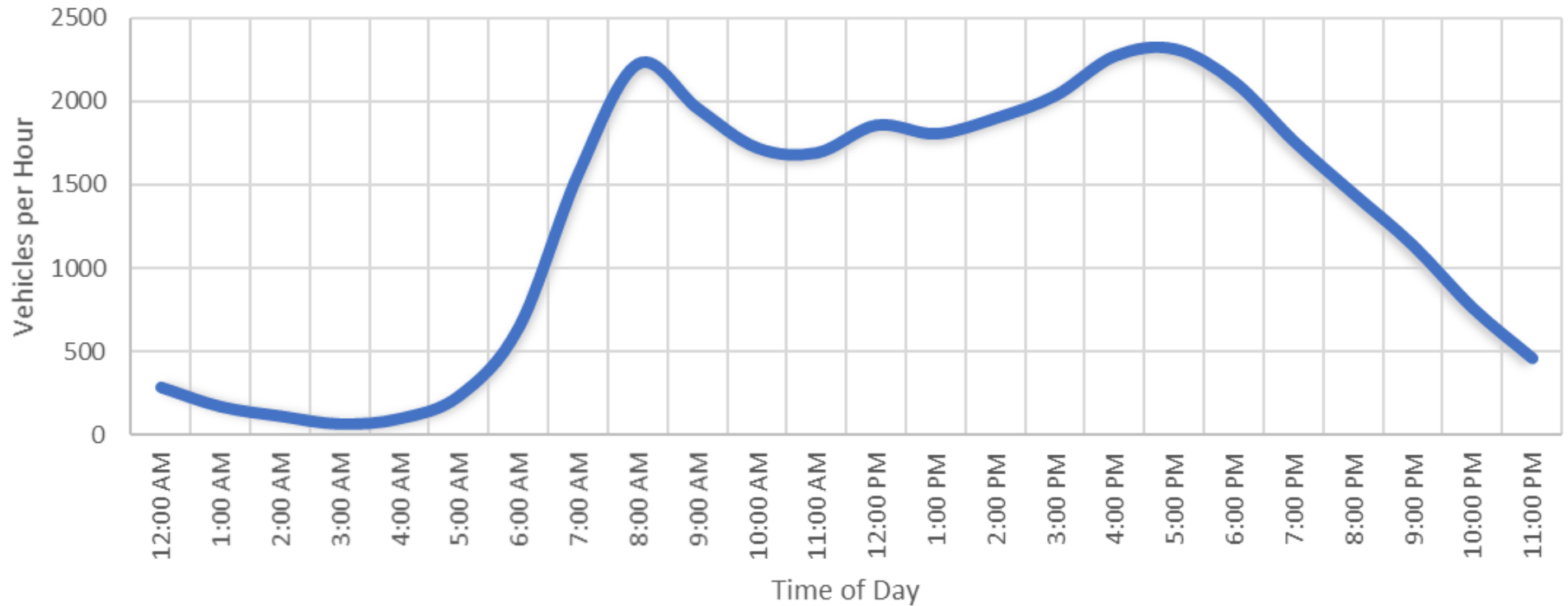


ATR Count Period: Sep 3 –Sep 6, 2019  
TMC Count Dates: Wednesday Sep 4, 2019  
Thursday Sep 5, 2019

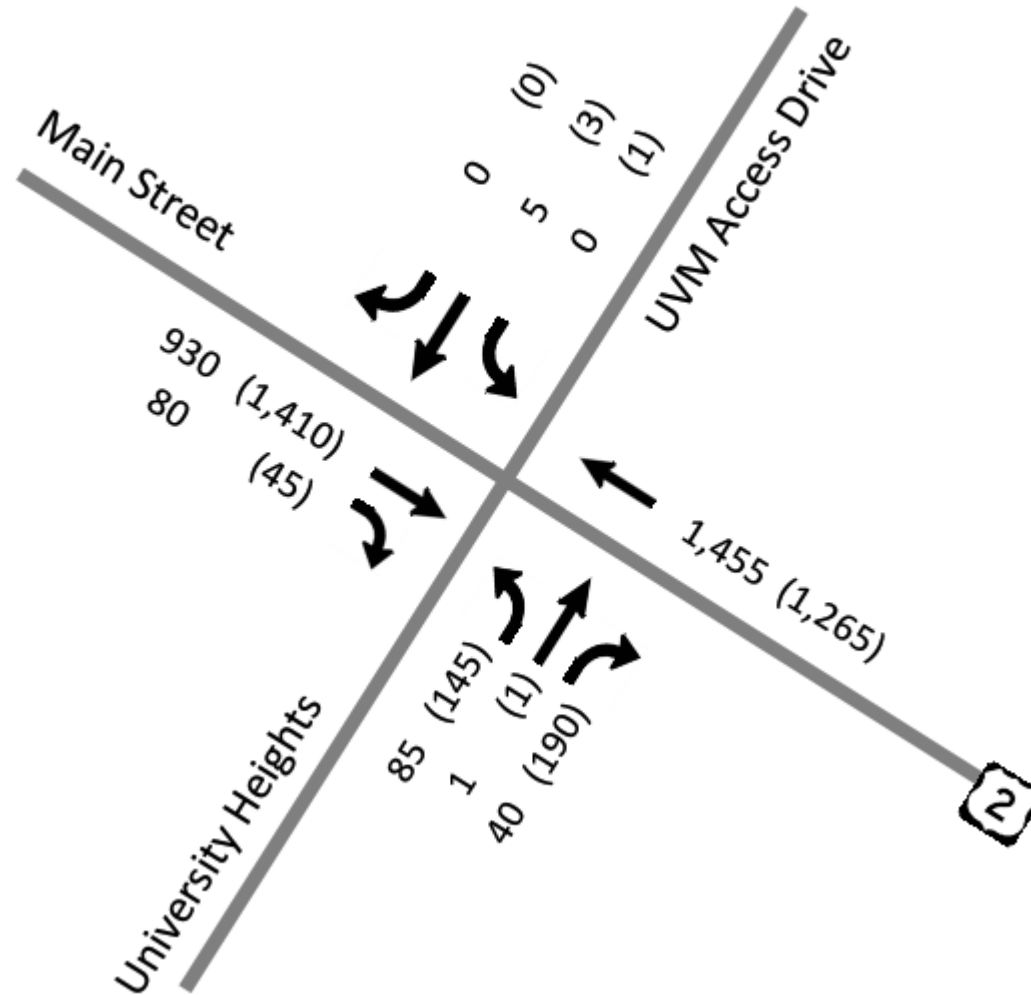
Intersection Count Periods: 7 am to 10 am  
4 pm to 7 pm

Peak Hours:	AM	PM
	WED: 7:45 to 8:45	WED: 4:45 to 5:45
	THU: 7:30 to 8:30	THU: 4:15 to 5:15

## Average Weekday Daily Traffic Volume Main Street (US 2)



	Volume	D%	%HV
Daily	30,600	-	7%
AM Peak Hour	2,230	58%	5%
PM Peak Hour	2,340	54%	5%

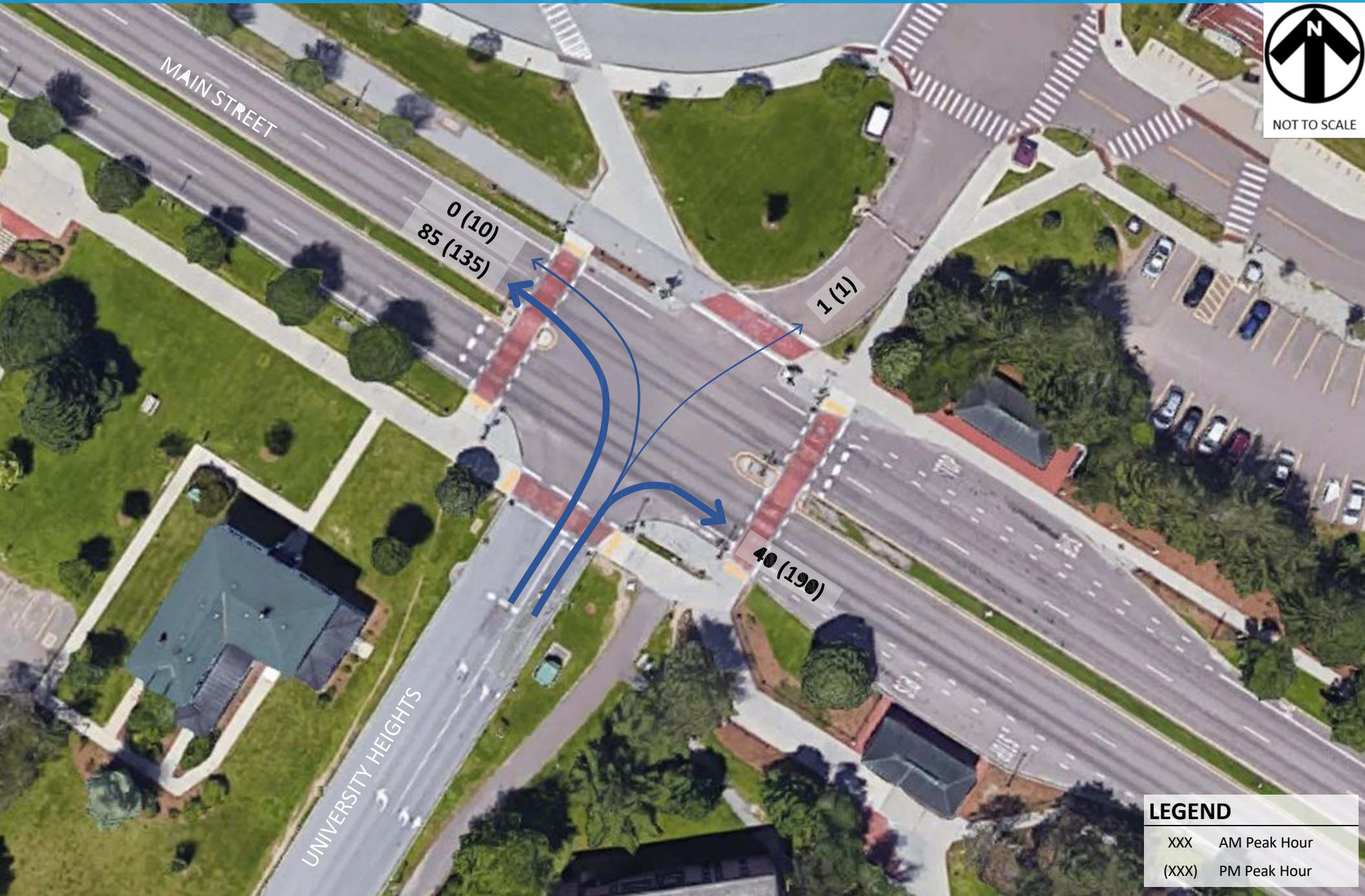


## LEGEND

XXX AM Peak Hour

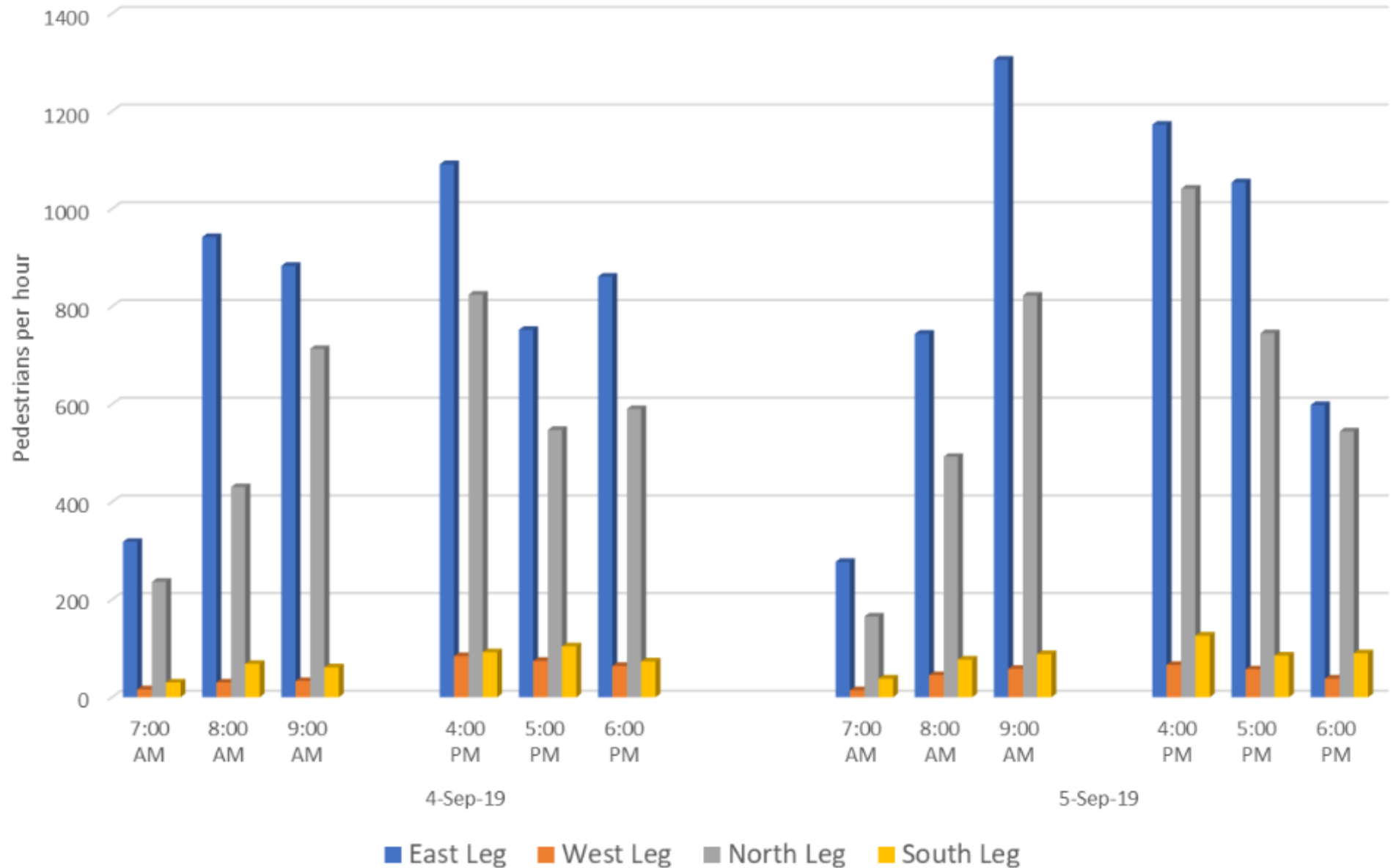
(XXX) PM Peak Hour





LEGEND	
XXX	AM Peak Hour
(XXX)	PM Peak Hour

## Main Street & University Heights

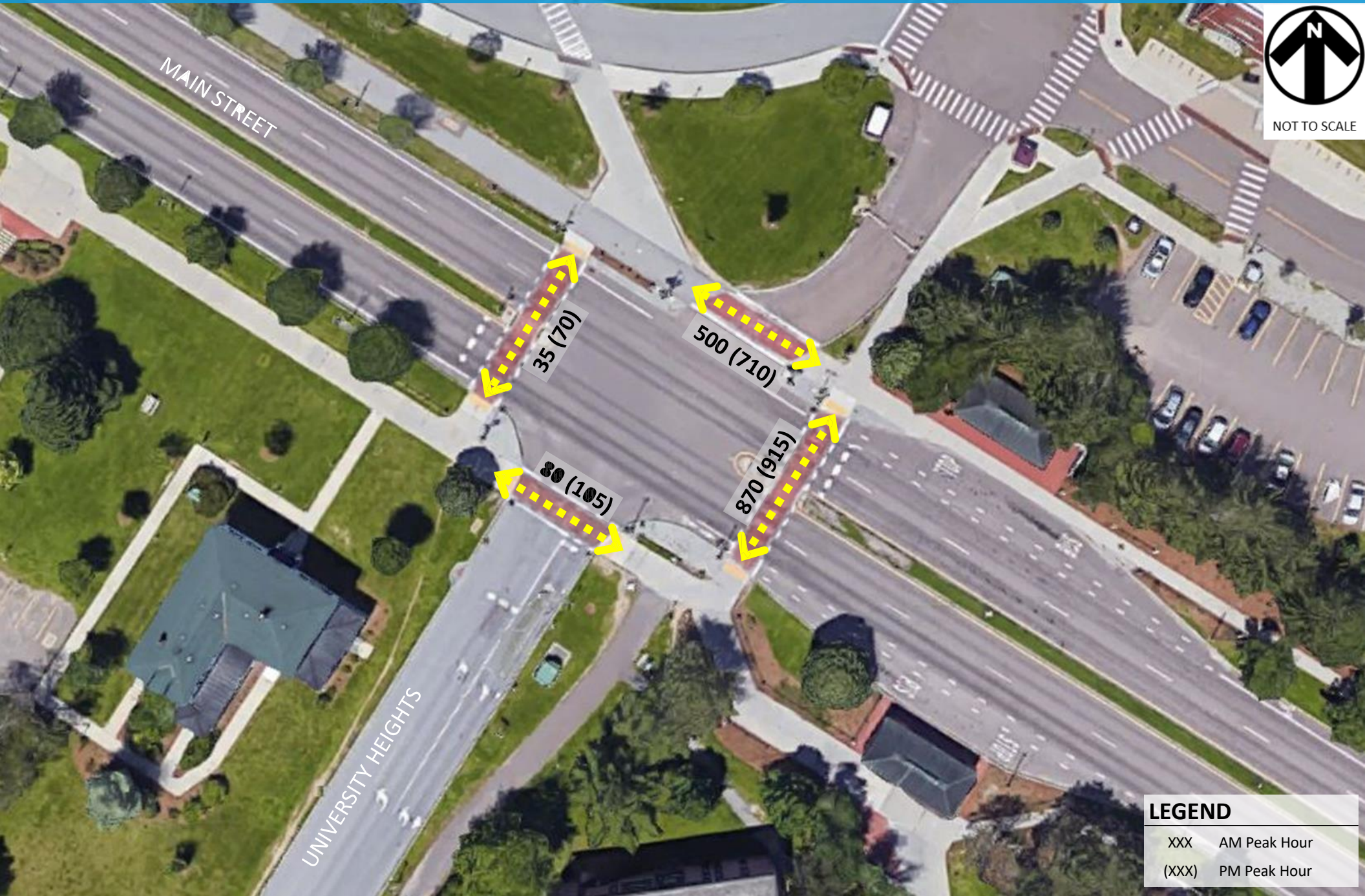




# EXISTING PEDESTRIAN VOLUMES (Peak Hour of Adjacent Street Traffic)



NOT TO SCALE



## LEGEND

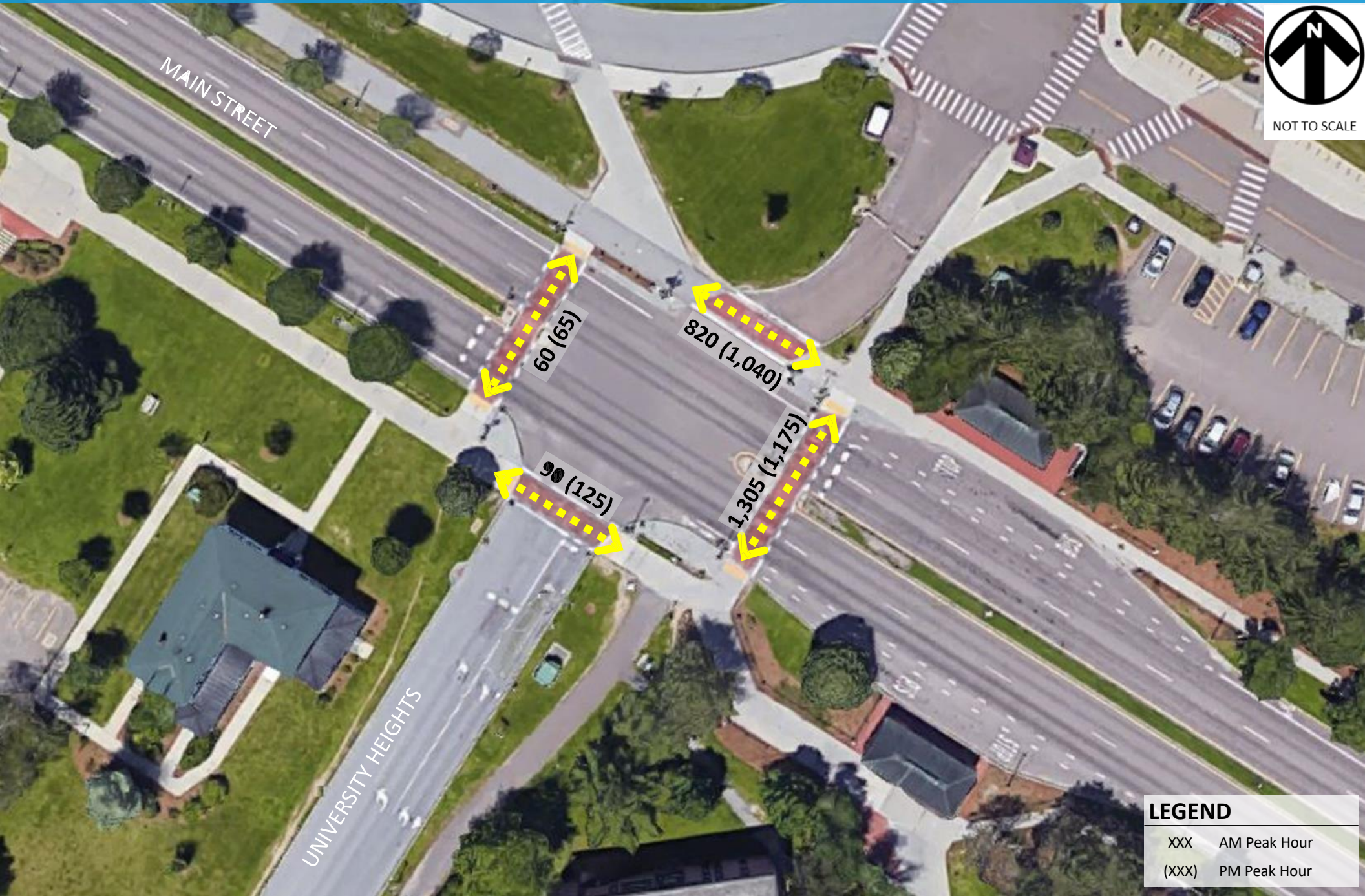
XXX	AM Peak Hour
(XXX)	PM Peak Hour



# EXISTING PEDESTRIAN VOLUMES (Peak Hour of Pedestrian Traffic)



NOT TO SCALE

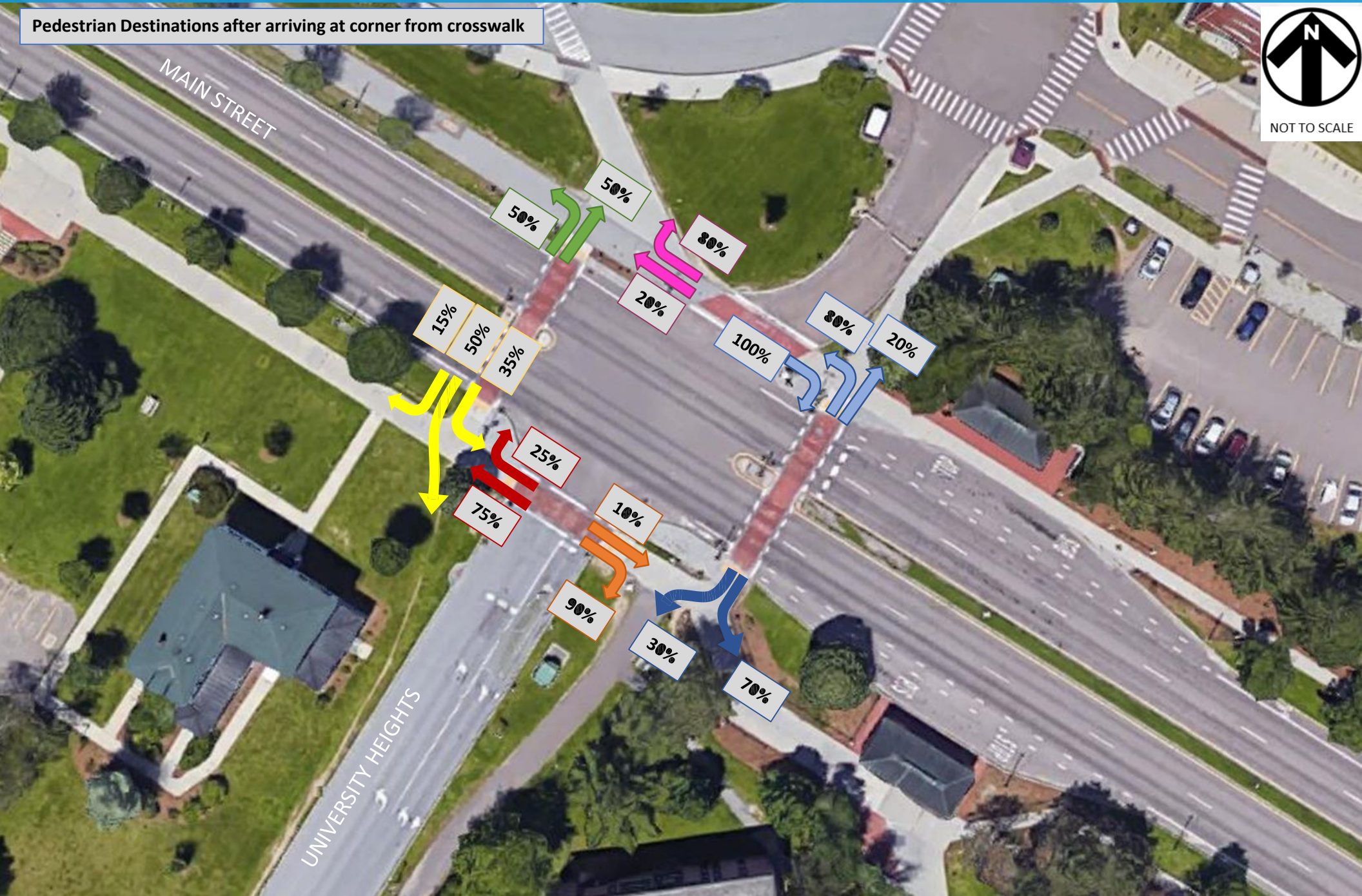


## LEGEND

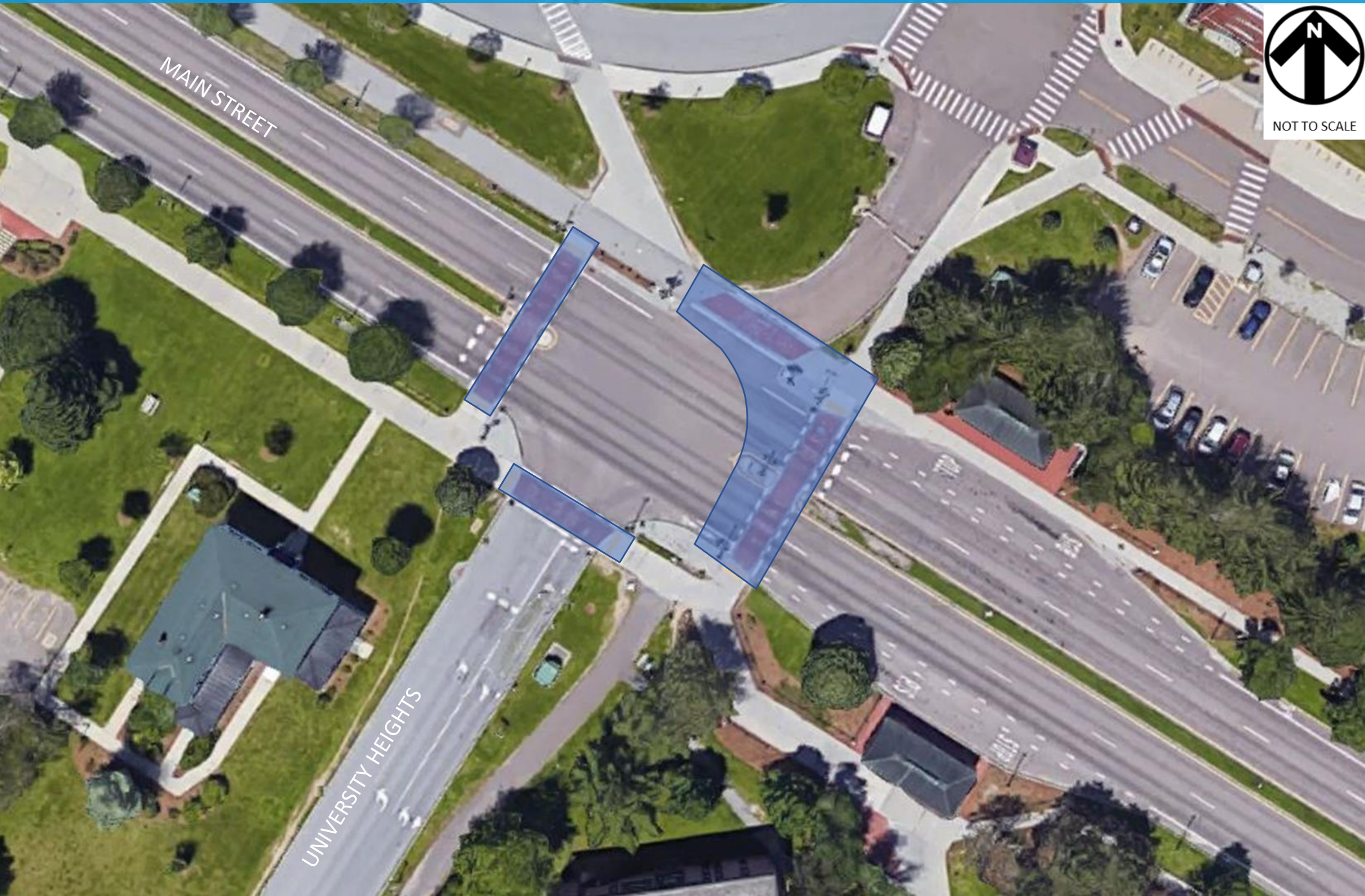
XXX	AM Peak Hour
(XXX)	PM Peak Hour



Pedestrian Destinations after arriving at corner from crosswalk














## BACKGROUND

**Table 1. Level of Service Criteria for Signalized Intersections**

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	$\leq 10$	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F <sup>1</sup>	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Scenario	Approach Geometries	Peak	Street	Approach	Lane Group	Weekday AM Peak		Weekday PM Peak	
						LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Existing Geometry & Signal Phasing	Northbound 	Vehicle Peak Hour	University Heights	NB	Left-turn	C	30.1	C	29.8
					Left-Thru-Right	C	33.6	F	122.0
	Southbound 		UMV Access	SB	Left-Thru-Right	C	23.4	C	22.2
			Main Street	EB	Thru-Right	A	9.0	B	17.7
				WB	Thru	B	11.4	B	14.4
	Overall Intersection					B	11.5	C	23.9
	Eastbound 	Pedestrian Peak Hour	University Heights	NB	Left-turn	C	28.5	C	30.5
					Left-Thru-Right	D	35.2	F	137.9
	UMV Access		SB	Left-Thru-Right	C	22.9	C	22.2	
	Main Street		EB	Thru-Right	A	9.0	B	16.9	
				WB	Thru	B	10.2	B	14.7
	Overall Intersection					B	11.0	C	24.9
Modified NB Geometry & Existing Signal Phasing	Northbound 	Vehicle Peak Hour	University Heights	NB	Left-Thru	C	32.7	C	31.1
					Right-turn	C	30.9	F	101.5
	UMV Access		SB	Left-Thru-Right	C	23.2	C	22.2	
	Main Street		EB	Thru-Right	A	9.1	B	17.7	
				WB	Thru	B	11.5	B	14.4
	Overall Intersection					B	11.6	C	22.2
	Eastbound 	Pedestrian Peak Hour	University Heights	NB	Left-Thru	C	29.1	C	30.8
					Right-turn	C	34.3	F	117.9
	UMV Access		SB	Left-Thru-Right	C	23.0	C	22.2	
	Main Street		EB	Thru-Right	A	8.8	B	16.9	
				WB	Thru	B	10.0	B	14.7
	Overall Intersection					B	10.9	C	23.1



Scenario	Condition	Street	Approach	Lane Group	Link Distance (feet)	Turn Bay Length (feet)	Weekday AM Peak Hour		Weekday PM Peak Hour	
							50th %tile Queue (feet)	95th %tile Queue (feet)	50th %tile Queue (feet)	95th %tile Queue (feet)
Existing Condition	Peak Hour of Adjacent Street Traffic	University Heights	NB	Left	245		50	75	75	125
				Left-Thru-Right		100	25	75	150	275
		SB	Left-Thru-Right	30		25	25	25	25	
		Main Stret	EB	Thru-Right	400		150	225	300	400
	WB		Thru	1000		275	350	225	300	
	Peak Hour of Pedestrian Traffic	University Heights	NB	Left-Thru	245		50	75	75	125
				Right		100	25	75	150	275
		SB	Left-Thru-Right	30		25	25	25	25	
		Main Street	EB	Thru-Right	400		125	175	275	375
	WB		Thru	1000		175	250	250	325	

## Traffic Operations

- Overall LOS B/C during AM and PM peak traffic and peak pedestrian hours
- LOS F for NB right-turn movement during PM peak traffic and peak pedestrian hours
- Design Queue for NB right-turn exceeds available lane length
- Adjacent signalized intersections affect arterial movement through the intersection

## Pedestrian Conditions

- High pedestrian volumes
- Generally good compliance with signals and crosswalks



- Exclusive Pedestrian Phase
- Extend Northbound Green Phase  
(with lagging protected right-turn )

Scenario	Approach Geometries	Peak	Street	Approach	Lane Group	Weekday AM Peak		Weekday PM Peak	
						LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Modified NB Geometry & Exclusive Ped Phase	Northbound	Vehicle Peak Hour	University Heights	NB	Left-Thru Right-turn	D C	46.7 34.6	D D	42.9 43.3
			UMV Access	SB	Left-Thru-Right	C	32.8	C	29.8
	Southbound		Main Street	EB	Thru-Right	B	17.2	C	32.7
				WB	Thru	C	23.0	C	25.7
	Overall Intersection				C	21.7	C	30.9	
	Eastbound	Pedestrian Peak Hour	University Heights	NB	Left-Thru Right-turn	D D	42.6 35.9	D D	43.2 43.3
			UMV Access	SB	Left-Thru-Right	C	33.3	C	29.5
	Westbound		Main Street	EB	Thru-Right	B	15.8	C	30.7
				WB	Thru	B	18.2	C	26.1
	Overall Intersection				B	18.6	C	30.2	
Modified NB Geometry & Extended NB Phase	Northbound	Vehicle Peak Hour	University Heights	NB	Left-Thru Right-turn	C B	22.9 19.5	C D	21.9 44.8
			UMV Access	SB	Left-Thru-Right	C	24.8	C	23.0
	Southbound		Main Street	EB	Thru-Right	B	15.0	C	33.9
				WB	Thru	C	20.4	C	23.1
	Overall Intersection				B	18.4	C	29.6	
	Eastbound	Pedestrian Peak Hour	University Heights	NB	Left-Thru Right-turn	C C	21.3 20.5	C D	26.0 47.8
			UMV Access	SB	Left-Thru-Right	C	25.0	C	24.8
	Westbound		Main Street	EB	Thru-Right	B	14.0	C	26.4
				WB	Thru	B	15.9	C	21.0
	Overall Intersection				B	15.5	C	25.5	





# ALTERNATIVE SCENARIO VEHICLE QUEUES

Scenario	Condition	Street	Approach	Lane Group	Link Distance (feet)	Turn Bay Length (feet)	Weekday AM Peak Hour		Weekday PM Peak Hour	
							50th %tile Queue (feet)	95th %tile Queue (feet)	50th %tile Queue (feet)	95th %tile Queue (feet)
Option 2: Exclusive Pedestrian Phase	Peak Hour of Adjacent Street Traffic	University Heights	NB	Left-Thru	245	100	50	100	100	150
				Right			25	50	125	200
		Main Street	SB	Left-Thru-Right	30		25	25	25	25
				Thru-Right	400		250	350	525	675
	Peak Hour of Pedestrian Traffic	University Heights	NB	Left-Thru	245	100	50	100	100	175
				Right			50	75	125	200
		Main Street	SB	Left-Thru-Right	30		25	25	25	25
				Thru-Right	400		200	275	500	650
		WB	Thru	1000		300	400	375	550	

Option 3: Extended NB Phase	Peak Hour of Adjacent Street Traffic	University Heights	NB	Left-Thru	245	100	25	75	50	100
				Right			25	50	75	150
		Main Street	SB	Left-Thru-Right	30		25	25	25	25
				Thru-Right	400		225	300	425	575
	Peak Hour of Pedestrian Traffic	University Heights	NB	Left-Thru	245	100	50	75	75	125
				Right			25	50	75	175
		Main Street	SB	Left-Thru-Right	30		25	25	25	25
				Thru-Right	400		175	225	350	500
		WB	Thru	1000		250	325	300	400	

## Exclusive Pedestrian Phase

- Longer Cycle Length
- Increased pedestrian delay
- Impacts arterial traffic progression on Main Street (signal coordination issue)
- Longer vehicle delays and queues on Main Street
- Design Queue for NB right-turn exceeds available lane length
- Potential for reduced pedestrian signal compliance (pedestrians crossing side streets and/or into Main Street median during vehicle phases)

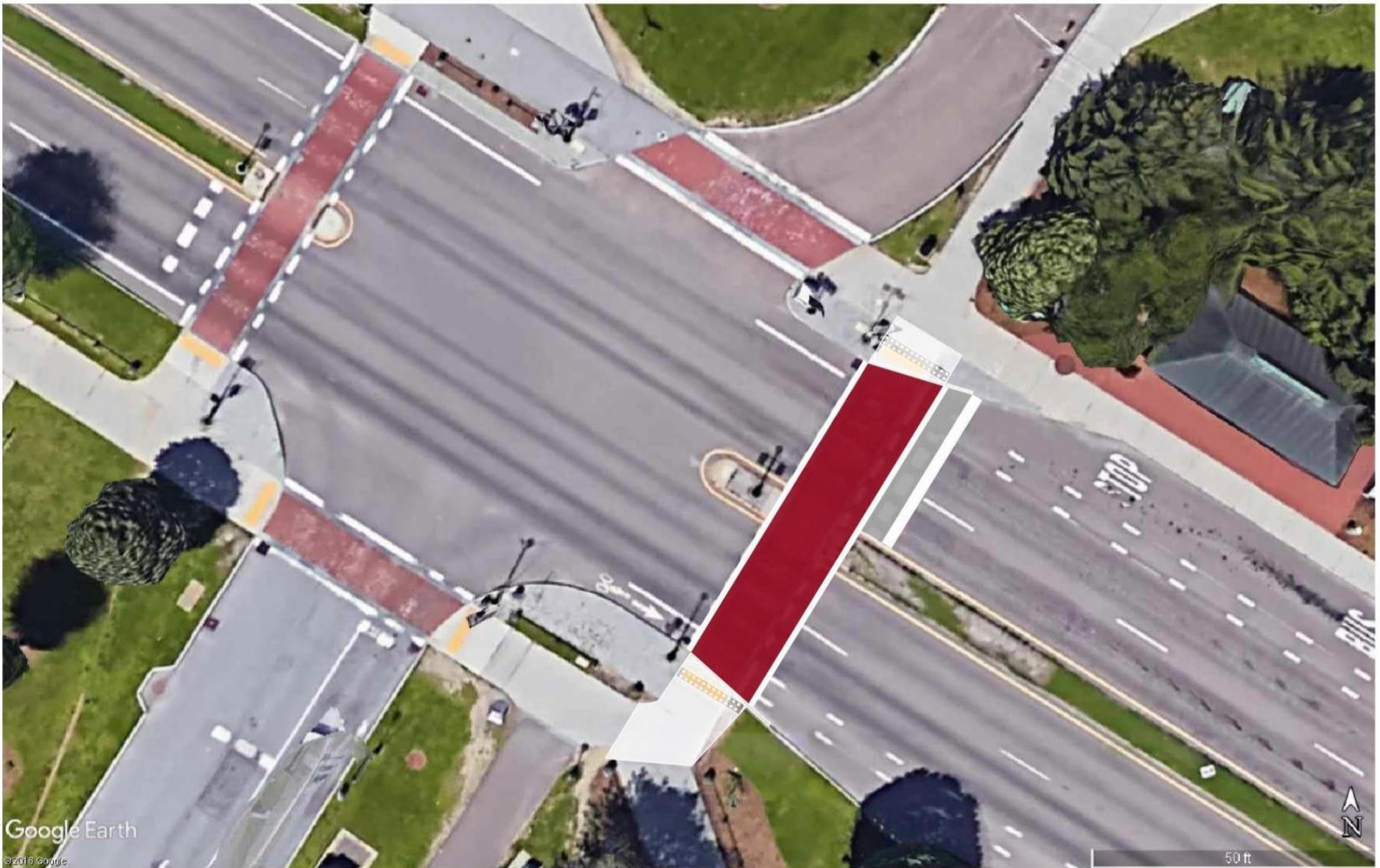
## Extend Northbound Green Phase (with lagging protected right-turn )

- Maintains the existing leading/concurrent pedestrian phasing
- Impacts arterial traffic progression on Main Street (signal coordination issue)
- Longer vehicle delays and queues on Main Street
- Design Queue for NB right-turn exceeds available lane length



## Other Potential Considerations

- Widen East Crosswalk
- Incentivize pedestrian use of West Crosswalk
- Incentivize increased use of existing pedestrian Davis Center tunnel





## General Considerations

- Pros:
  - Wider crosswalk better accommodates high pedestrian volume
  - May improve pedestrian compliance with crosswalk limits
  - Improves pedestrian LOS on eastern crosswalk
- Cons:
  - Widening crosswalk could further expand crossing area used by pedestrians
  - Wider crosswalk reduces target value for pedestrians crossing during low-volume and/or nighttime conditions
  - Wider crosswalk may not reduce vehicle traffic delay (bi-directional pedestrian crossings don't guarantee more gaps for vehicles)

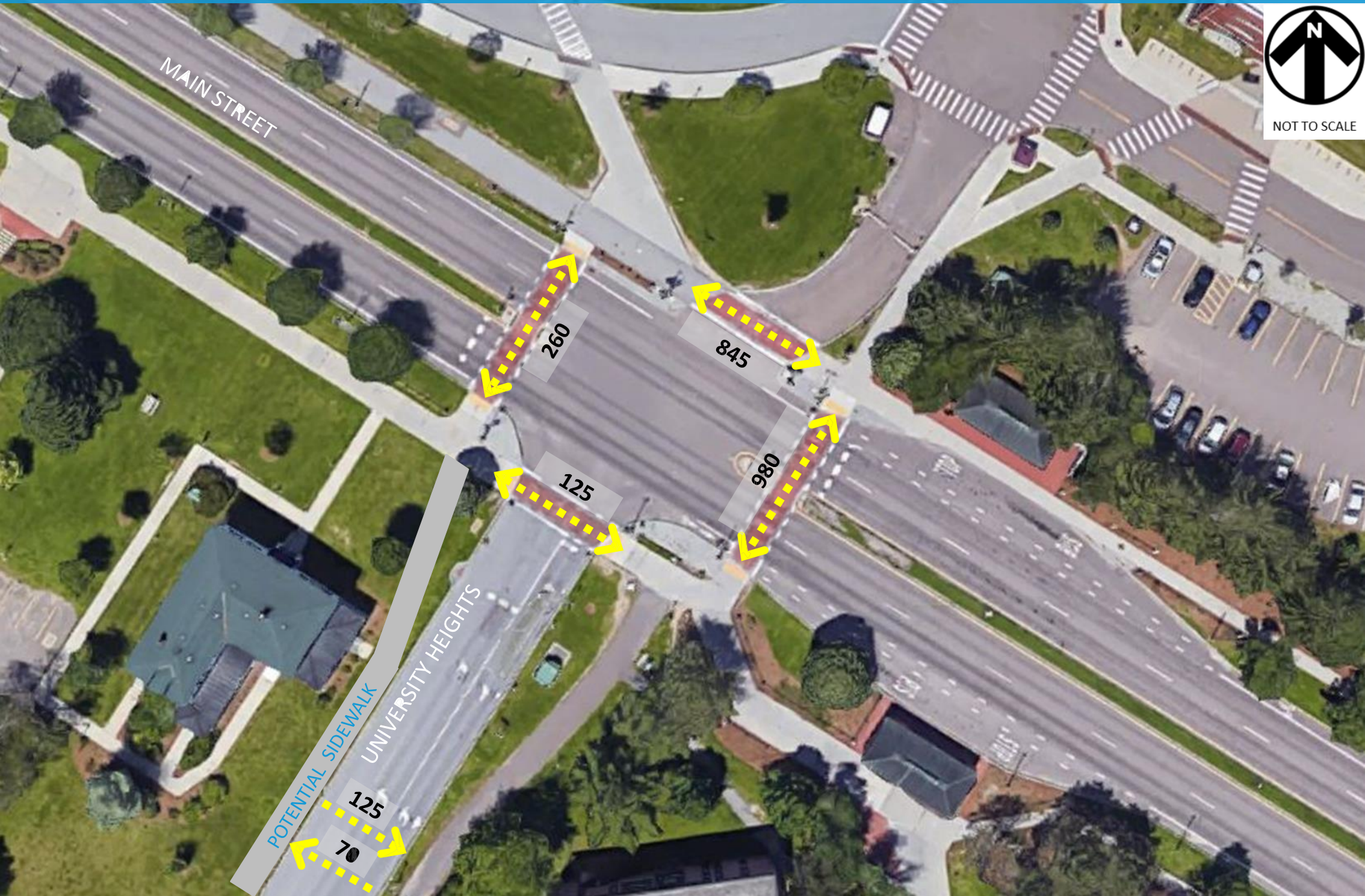




# REDISTRIBUTED PEDESTRIAN VOLUMES WITH WEST-SIDE SIDEWALK (PM Peak Hour of Pedestrian Traffic)



NOT TO SCALE

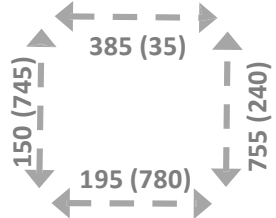
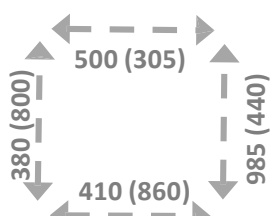
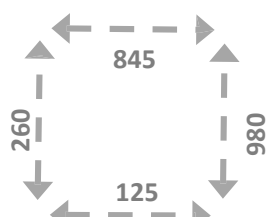




## Construction of a new sidewalk along University Heights

- Pros:
  - Estimate 200 +/- pedestrians redirected to western crosswalk in peak hours
  - Reduces conflicts/delays for NB right-turning vehicles on University Heights
  - Improves pedestrian LOS on eastern crosswalk
- Cons:
  - Increases conflicts/delays for NB left-turning vehicles on University Heights
  - Increases conflicts/delays for EB right-turning vehicles on Main Street
  - Increase NB approach delay due to left-turn delay
  - Create mid-block crossing on University Heights for pedestrians to access new sidewalk

Scenario	Peak	Street	Approach	Lane Group	Weekday AM Peak		Weekday PM Peak	
					LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Existing Pedestrian Distributions	<b>Vehicle Peak Hour</b> 	University Heights	NB	Left-turn	C	30.1	C	29.8
				Left-Thru-Right	C	33.6	F	122.0
		UMV Access	SB	Left-Thru-Right	C	23.4	C	22.2
		Main Street	EB	Thru-Right	A	9.0	B	17.7
			WB	Thru	B	11.4	B	14.4
		Overall Intersection			B	11.5	C	23.9
	<b>Pedestrian Peak Hour</b> 	University Heights	NB	Left-turn	C	28.5	C	30.5
				Left-Thru-Right	D	35.2	F	137.9
		UMV Access	SB	Left-Thru-Right	C	22.9	C	22.2
		Main Street	EB	Thru-Right	A	9.0	B	16.9
			WB	Thru	B	10.2	B	14.7
		Overall Intersection			B	11.0	C	24.9
50-50 Pedestrian Distribution Crossing Main Street	<b>Vehicle Peak Hour</b> 	University Heights	NB	Left-Thru	D	39.1	D	44.2
				Right-turn	C	32.0	E	71.3
		UMV Access	SB	Left-Thru-Right	C	22.8	C	22.2
		Main Street	EB	Thru-Right	A	9.8	B	18.1
			WB	Thru	B	12.1	B	14.4
		Overall Intersection			B	12.4	C	21.3
	<b>Pedestrian Peak Hour</b> 	University Heights	NB	Left-Thru	D	41.5	D	54.1
				Right-turn	C	32.2	F	83.5
		UMV Access	SB	Left-Thru-Right	C	22.9	C	22.2
		Main Street	EB	Thru-Right	A	9.3	B	17.2
			WB	Thru	B	10.3	B	14.7
		Overall Intersection			B	11.6	C	22.3

Scenario	Peak	Street	Approach	Lane Group	Weekday AM Peak Hour		Weekday PM Peak Hour	
					LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Pedestrian Distribution for Balanced Delay for NB Movements	<b>Vehicle Peak Hour</b> 	University Heights	NB	Left-Thru Right-turn	C	33.8	E	61.5
					C	33.9	E	61.5
		UMV Access	SB	Left-Thru-Right	C	23.2	C	22.2
		Main Street	EB	Thru-Right	A	9.2	B	17.5
			WB	Thru	B	11.5	B	14.0
	Overall Intersection				B	11.7	C	20.9
	<b>Pedestrian Peak Hour</b> 	University Heights	NB	Left-Thru Right-turn	D	35.6	E	69.3
					D	35.8	E	69.5
		UMV Access	SB	Left-Thru-Right	C	22.9	C	22.2
		Main Street	EB	Thru-Right	A	9.2	B	17.0
WB			Thru	B	10.3	B	14.5	
Overall Intersection				B	11.4	C	22.0	
Redistributed Pedestrian Volumes with West-Side Sidewalk (PM Only)	<b>Pedestrian Peak Hour</b> 	University Heights	NB	Left-Thru Right-turn			D	40.6
							F	138.8
		UMV Access	SB	Left-Thru-Right			C	22.2
		Main Street	EB	Thru-Right			B	16.9
			WB	Thru			B	14.7
		Overall Intersection						C



## Concept: INCENTIVIZE INCREASED USE OF EXISTING DAVIS CENTER PEDESTRIAN TUNNEL





- Vehicle speeds on Main Street:  
Average Speed: EB - 21 mph  
WB - 27 mph  
  
85<sup>th</sup> %tile Speed: EB - 30 mph  
WB - 33 mph
- Potential Traffic Calming Options:

*Transverse Speed Markings*



*Radar Feedback Signs*







NOT TO SCALE